U.S. NAVAL MEDICAL FIELD
RESEARCH LABORATORY
CAMP LEJEUNE, NORTH CAROLINA

Vol. XXI, No. 19

August 1971

PRE-SERVICE TEST OF THE U.S. ARMY ULTRA LOW VOLUME AERIAL SPRAY SYSTEM FOR ROTARY WING AIRCRAFT

by

LCDR R. H. Grothaus, MSC, USN

Bureau of Medicine and Surgery, Navy Department
Work Unit M4305.12-3012BXG6.2

11

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)	2a. REPORT SECURITY CLASSIFICATION
Naval Medical Field Research Laboratory Camp Lejeune, N. C. 28542	Unclassified
	2b. GROUP

3. REPORT TITLE

PRE-SERVICE TEST OF THE U.S. ARMY ULTRA LOW VOLUME AERIAL SPRAY SYSTEM FOR ROTARY WING AIRCRAFT

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final report

5. AUTHOR(S) (First name, middle initial, last name)

Roger H. Grothaus, LCDR MSC USN

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
August 1971	12	0

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO. M4305	M4305.12-3012BXG6.2
c. Task No. M4305.12	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d. Work Unit No. M4305.12-3012BXG6	Vol. 21, No. 19

10. DISTRIBUTION STATEMENT

Approved for public release; distribution unlimited.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
	Bureau of Medicine and Surgery Navy Department Washington, D. C. 20390

13. ABSTRACT

A pre-service test on the U.S. Army's Ultra Low Volume ~~(ULV)~~ Aerial Spray System, Rotary Wing Aircraft, ~~Task No. 3A664717D820.01.019~~, was conducted during the summer of 1970. The system was utilized to treat a 500-acre plot infested with lone star ticks, ~~(*Amblyomma americanum*)~~. The system proved adequate from a biological and engineering standpoint. Minor problems were identified and noted. (U)

DD FORM 1 NOV 65 1473 (PAGE 1)

S/N 0102-014-6700

UNCLASSIFIED

Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Insect dispersal equipment						
Aerial spray system						
Insect control						
Vector control						

Vol. XXI, No. 19 August 1971

PRE-SERVICE TEST OF THE U.S. ARMY ULTRA LOW VOLUME AERIAL SPRAY SYSTEM FOR ROTARY WING AIRCRAFT

by

LCDR R. H. Grothaus, MSC, USN

Entomology Division
NAVAL MEDICAL FIELD RESEARCH LABORATORY
CAMP LEJEUNE, NORTH CAROLINA 28542

Bureau of Medicine and Surgery, Navy Department
Work Unit M4305.12-3012BXG6.2

Submitted by:

R. H. GROTHAUS
LCDR MSC USN
Chief, Entomology Division

Approved by:

JESSE F. ADAMS
CAPT MC USN
Commanding Officer

SUMMARY PAGE

THE PROBLEM

To develop or obtain a practical aerial spray system to provide vector control support for Navy and Marine Corps personnel in the field.

FINDINGS

A U.S. Army ultra low volume (ULV) spray system for rotary wing aircraft was given a pre-service test and found to have entomological potential. However, a few maintenance problems were encountered during the testing phase.

RECOMMENDATIONS

1. That the system functioned well enough to be given a service test with an ultimate goal of type classification.

2. That changes be made in the operations manual so that less damage is caused by the spray chemicals.

3. That certain engineering changes be made on problems that have already been identified.

ADMINISTRATIVE INFORMATION

Bureau of Medicine and Surgery, Department of the Navy, Work Unit M4305.12-3012BXG6, report 2. Final report. Approved for publication 13 August 1971

Published by the Naval Medical Field Research Laboratory, Camp Lejeune, North Carolina 28542.

ABSTRACT

A pre-service test on the U.S. Army's Ultra Low Volume (ULV) Aerial Spray System, Rotary Wing Aircraft, Task No. 3A664717D820.01.019, was conducted during the summer of 1970. The system was utilized to treat a 500-acre plot infested with lone star ticks (*Amblyomma americanum*). The system proved adequate from a biological and engineering standpoint. Minor problems were identified and noted.

INTRODUCTION

In June 1970 the Entomology Division, Naval Medical Field Research Laboratory, Camp Lejeune, N.C. conducted a pre-service test on the U.S. Army Sprayer, Insecticide, Liquid (ULV), Rotary Wing Aircraft (Task No. 3A664717D820.01.019) (Figure 1). This unit was developed by the U.S. Army Medical Equipment Research and Development Laboratory, Fort Totten, Flushing, L.I., N.Y.

DISCUSSION

The primary purpose of the test at Camp Lejeune was to provide an operational test to define any gross problems in the prototype unit.

Shipping

The unit was prepackaged and air shipped to Camp Lejeune, N.C. Return shipment was by ground transportation. No difficulty was found in handling the shipping container. No damage was encountered during the shipping. The unit was uncrated by an untrained four-man crew in less than 10 minutes.

Aircraft Installation

The unit was installed in a U.S. Marine Corps HU-1 type aircraft in 15 minutes. An additional 10 minutes were utilized in safety wiring the boom support cables.

Flight Characteristics

No undesirable problems were encountered. Pilot comments were very favorable. Flight characteristics of aircraft remained unaltered at 80-90 knots. No contamination of the aircraft was observed.

Functional Operation

The test was conducted at Camp Lejeune, N.C. against the lone star tick (*Amblyomma americanum*) using Dibrom® 14. The test site encompassed 500 acres and the area was covered with one canopy vegetation with pine as the dominant tree group.

The tick population was variable, ranging from 0 to 300 specimens per 100-foot drag. Productive tick areas were located within the test site and marked as sampling sites. The test was conducted on 7 June during the early morning hours. The spray mission was flown crosswind (less than 5 mph) at an altitude of 200 feet. The air-speed of the helicopter ranged from 75-80 knots. An effective swath width of 200 feet was anticipated, so the mission was flown at 200-foot intervals.

The flow-rate of the spray system was checked on 6 June and the unit was calibrated for about 3/4 oz of chemical per acre. During the mission the dosage varied, apparently due to changes in viscosity, etc. of the chemical. Some areas received dosages nearing 2 oz/acre while some received less. Because of this non-system problem, control evaluation was extremely difficult. Observers noted that the chemical reached the ground effectively and post-treatment counts indicated a 24-hour reduction of ticks in excess of 50%. Although

specific control values could not be established, it was evident from the available observations that the system was capable of providing biologically effective treatment levels for tick control.

Investigators working on ULV systems are becoming more aware of the increased difficulty of accurately calibrating equipment for use with heavy liquids such as Dibrom. These newer compounds are quite viscous and small temperature changes greatly affect flow rates. Because of this problem, it might be desirable to develop a temperature/flow meter package which would allow the spray controller to correct for changes in the flow rate of the system.

Insecticide Refilling

For large operations the tank height may be of concern. Refilling the unit in the aircraft is difficult because of the available working distance between the spray unit and the overhead (Figure 1). This problem can be overcome most easily by using a small hand pump and a transfer line.

Maintenance

After the test flight was conducted, the spray unit was returned to the landing area and flushed with diesel fuel followed by one flushing with water. The unit was returned to the field laboratory where it received a second soapy water flush. The system was stored until September and reassembled for ground tests. During the storage period, the nylon fittings were damaged beyond use and had to be replaced (Figure 2). In an effort to identify the exact cause of the fitting damage, nylon (Zytel) connectors were treated in the following manner: (1) One unit was soaked in Dibrom for 2 hours and air dried for 3 months. (2) One unit was soaked in JP-5 fuel for 2 hours and air dried for 3 months. (3) One unit was soaked in Dibrom for 2 hours, then flushed with JP-5 and air dried for 3 months. The fitting soaked only in JP-5 was unchanged. The other two units became progressively softer for about 5 weeks, then rehardened. The unflushed unit showed the greater degree of softening (Figure 3). It appears that when the lines are not opened for good ventilation, deterioration takes place because of small amounts of Dibrom which seep into the threads of the fittings.

It is recommended that the service manual include directions for opening up the system after use so that complete drying can take place. It is further recommended that the chemical lines be broken down for long-term storage.

The only additional problem noted was the fragile nature of the plastic control face on the insecticide pump. This unit was cracked during servicing of the unit. The service manual should note the ease with which the unit can be broken. An additional pump face should be included in the parts kit.

SUMMARY

This spray unit is well designed and appears to be essentially ready for full biological service testing. Because of the simple design, self-contained electrical system, and light weight, procurement costs should be low. Considering all factors, this unit would further aid in providing the military a complete vector control capability.

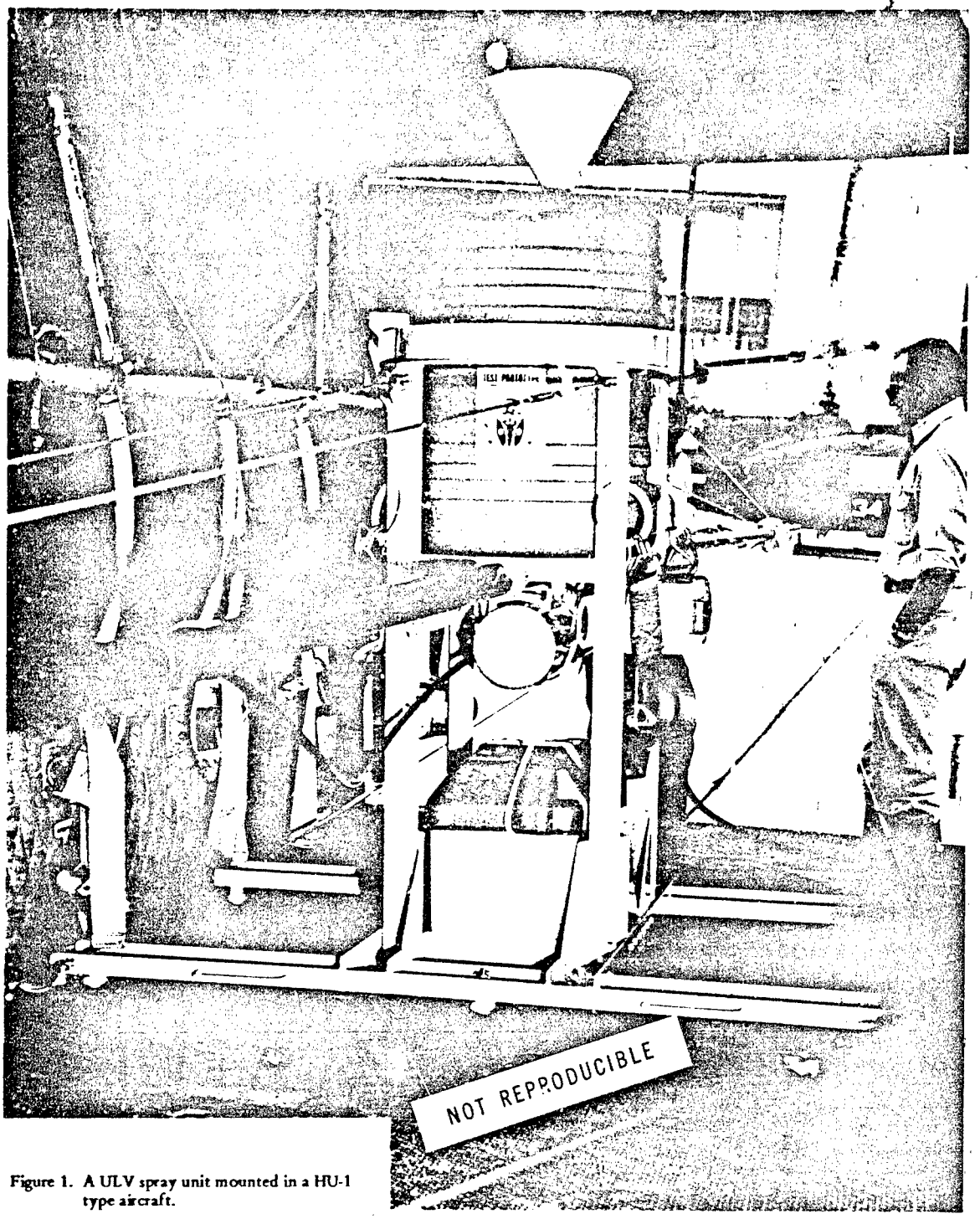

Figure 1. A ULV spray unit mounted in a HU-1 type aircraft.

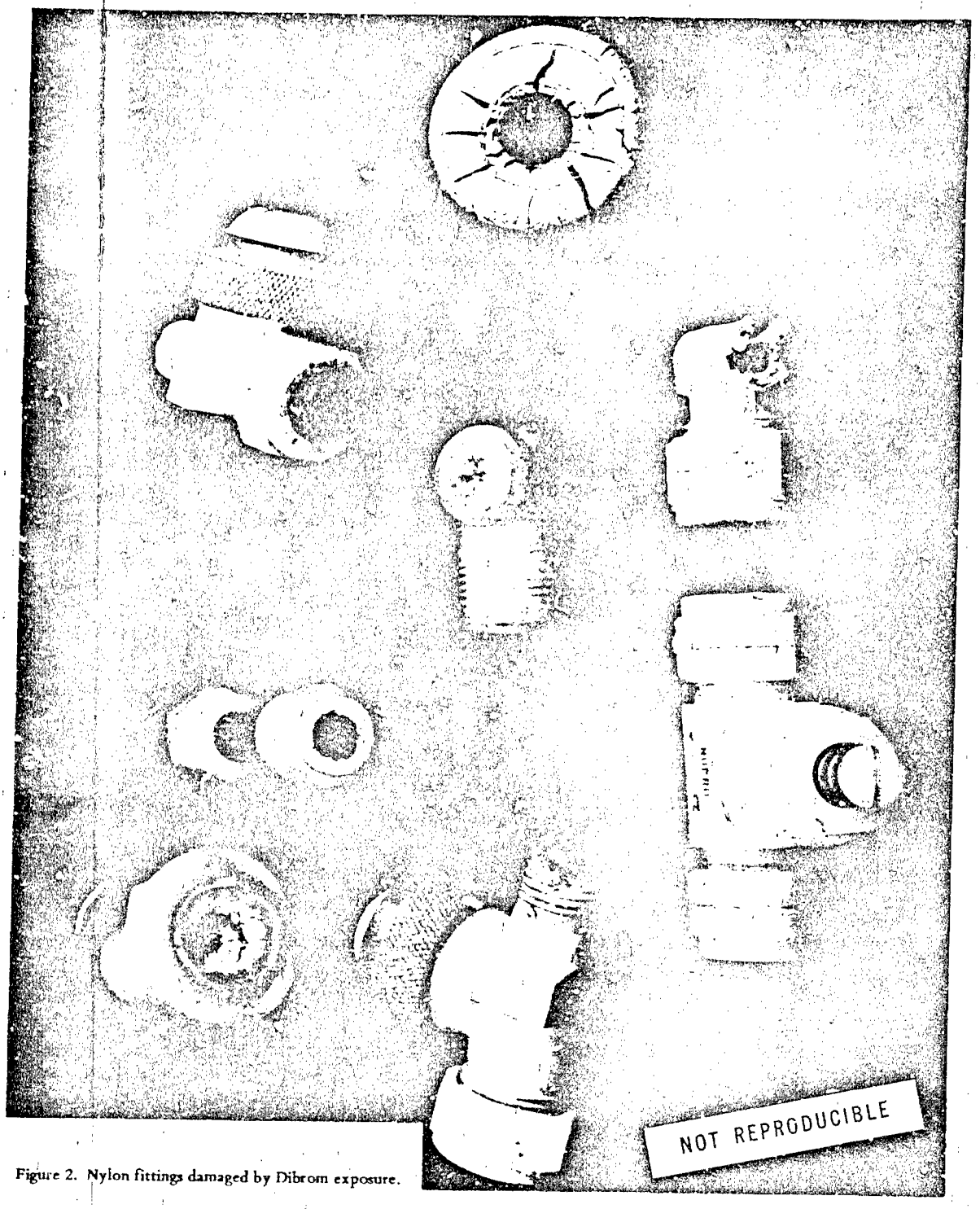

Figure 2. Nylon fittings damaged by Dibrom exposure.

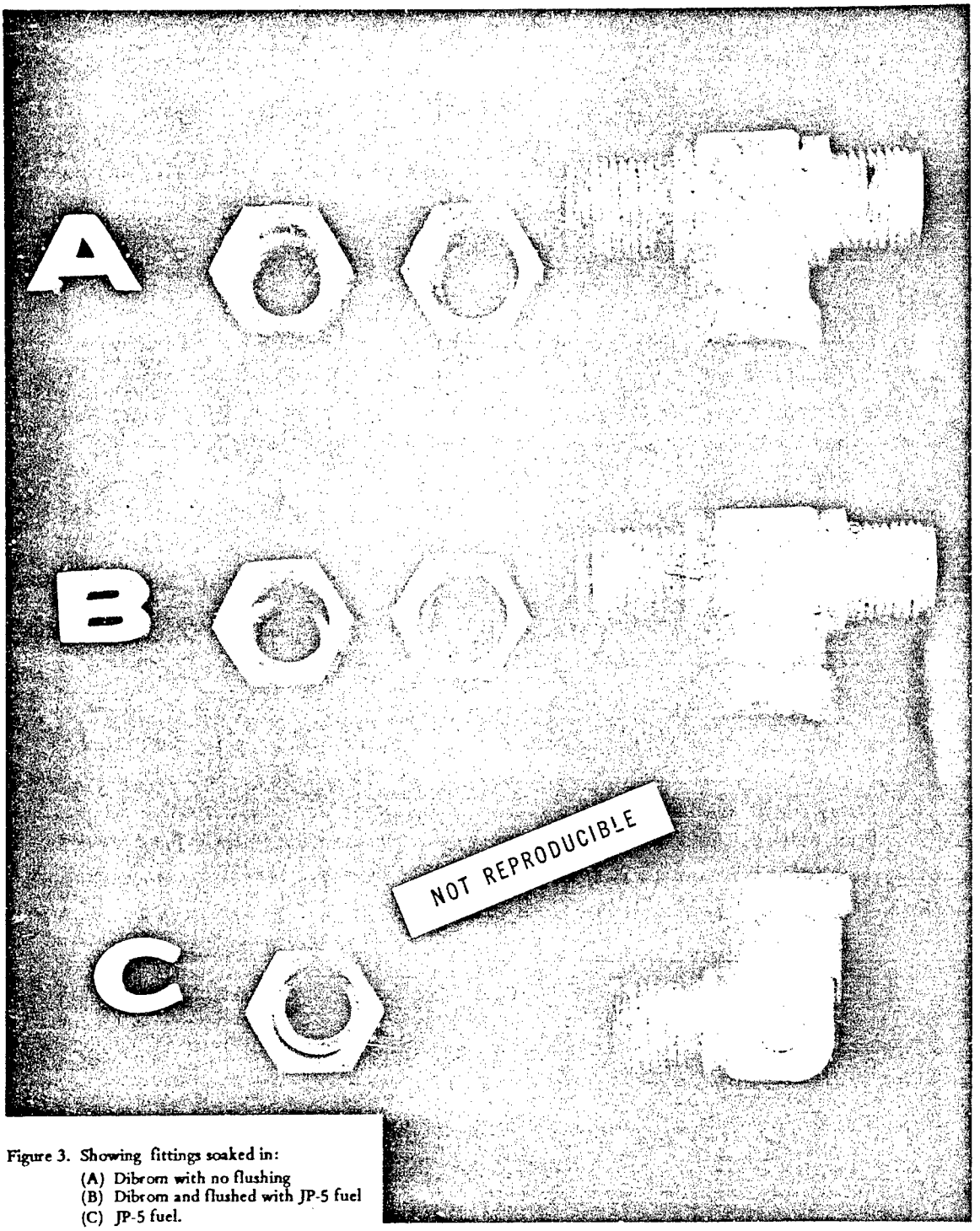

Figure 3. Showing fittings soaked in:
(A) Dibrom with no flushing
(B) Dibrom and flushed with JP-5 fuel
(C) JP-5 fuel.